crystallizing said PZT ferroelectric film by applying a thermal annealing process in an atmosphere containing a non-oxidizing gas and an oxidizing gas; and

forming an upper electrode layer on said PZT ferroelectric film, wherein said step of crystallizing said PZT ferroelectric film is conducted by setting a composition of said atmosphere such that said atmosphere contains said oxidizing gas with a fraction of 1 to 50% in volume.

15. (Amended) A semiconductor device, comprising:

a substrate;

an active device element formed on said substrate;

an insulation film provided over said substrate to cover said active device element;

a lower electrode provided over said insulation film;

a PZT ferroelectric film provided on said lower electrode, said PZT ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said PZT ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said PZT ferroelectric film essentially consisting of crystal grains having a generally uniform grain diameter of less than about 200 nm; and

an upper electrode provided on said PZT ferroelectric film.

16. (Amended) A semiconductor device as claimed in claim 15, wherein said crystal grains constituting said PZT ferroelectric film have an average diameter of about 150 nm.

19. (Amended) A semiconductor device as claimed in claim 17, wherein said PZT ferroelectric film has a perovskite structure.

21. (Amended) A method of fabricating a semiconductor device having a ferroelectric capacitor, comprising the steps of:

forming an active device element on a substrate;

forming an insulation film over said substrate to cover said active device element;